

City of Austin Green Infrastructure Benchmarking Questionnaire 2012

I. GREEN INFRASTRUCTURE TECHNOLOGY

1. What type of stormwater technologies does your city use? (please select all that apply)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
rain gardens/bioretentation	1	1	1	0	1	1	1	6
green roofs	1	1	1	0	1	1	0	5
biofiltration	1	1	1	0	1	1	1	6
cisterns/rain barrels	1	1	1	0	1	1	1	6
porous pavement	1	1	1	1	1	1	1	7
vegetated filter strips	1	1	1	0	1	0	0	4
other (please specify)	1	1	1	1	0	0	0	4
<i>answered question</i>								7
<i>skipped question</i>								0

other (please specify)

New York: Blue roofs and other detention based methods

Chicago: infiltration vaults, drainage swales, etc.

Philadelphia: Stormwater tree trenches;stormwater curb bump-outs;stormwater planters;downspout planters

Phoenix: on-site retention

2. What is the primary objective of your green infrastructure installations? (please select all that apply)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
reduce combined sewer overflow (CSO)	1	1	1	0	1	1	0	5
reduce stormwater volume runoff	1	0	1	1	1	1	1	6
minimize stormwater peak flows	1	1	1	0	1	0	1	5
water conservation	0	0	0	0	0	0	1	1
water quality pollutant removal	0	0	0	0	1	1	1	3
other (please specify)	0	0	0	0	0	1	1	2
<i>answered question</i>								7
<i>skipped question</i>								0

other (please specify)

Tucson: residential right-of-way irrigation method (no construction of pipe/pump irrigation)

Seattle: matching duration (and peaks) for creek channel forming flow (1-2yr)

3. Do you use the following methodologies for sizing green infrastructure? (please select all that apply)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
prescribed volume and drawdown time	1	0	1	0	1	0	0	3
design storm	1	0	0	1	1	0	1	4
maintain predevelopment conditions	0	0	0	0	1	1	1	3
Please describe in detail the methodologies selected above or others not identified on the list								6
<i>answered question</i>								6
<i>skipped question</i>								1

Please describe in detail the methodologies selected above or others not identified on the list

New York: NYC strives to manage the 1" storm for most projects, however in the right of way we have a bioswale standard (20'x5'x4") that we install by determining a minimum runoff volume per tributary area.

Chicago: "Rate Control" or detention volume is based on a 100-year storm. "Volume Control" must be met by one of two options: 1) capture and store 1/2 inch of rainfall over the impervious area on the site, or 2) reduce the impervious area percentage on the site by 15% or more compared with existing conditions.

Portland: There are three primary sizing methodologies allowed:

- 1) Simplified Approach - small projects are allowed to use a simple sizing factor (percentage of the drainage area).
- 2) Presumptive Approach - use of a SCS curve number / Santa Barbara unit hydrograph based spreadsheet provided by the City. Most commonly used.
- 3) Performance Approach - engineering calculations using approved methods such as continuous simulation.

Additional flow control requirements related to predevelopment conditions and vary depending upon the ultimate receiving sewer or stream.

Phoenix: on-site retention for a 100-yr, 2-hr storm.

Tucson: We (Pima County, Arizona) are looking at how to capture 0.5 to 0.75 inches of the first rainfall for each event (Marie Light - Principal Hydrologist).

Commercial Rainwater Harvesting Ordinance includes calculation tables to address plant need requirements (Iren Ogata - Urban Landscape Manager)

Oro Valley uses pre-development conditions, I believe, so that the water courses still receive some water. Pima County uses a design storm and may be currently changing the precise measurements. Both are located in the Tucson region (Mead Meir, Sr Planner w Pima Assoc of Governments).

Seattle: Various stormwater business area needs drive what performance target we use. see GSI presized calculator for examples

<http://www.seattle.gov/dpd/Codes/StormwaterCode/Modeling/default.asp>

4. What type of hydrologic model do you use to quantify the impact of green infrastructure on peak flow (flood reduction)? (please select all that apply)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
SCS curve number	1	0	1	0	1	0	1	4
rational method	1	0	0	0	0	0	1	2
SWMM (or other continuous simulation models)	1	0	0	0	1	1	0	3
proprietary model	0	0	0	0	1	0	1	2
other	1	1	0	0	0	0	0	2
Please specify other or the name of the proprietary model used.								3
<i>answered question</i>								6
<i>skipped question</i>								1

Please specify other or the name of the proprietary model use

New York: we use Infoworks for a variety of modeling for the city.

Chicago: The City's spreadsheet tool uses the modified rational method for sites < 20 acres. A hydrograph method is required for sites >= 20 acres.

Portland: XP-SWMM

5. Does your agency allow best management practices (BMPs) to perform multiple stormwater functions e.g., water quality and detention, or do you require

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
separate basins allowed	0	0	0	0	0	0	0	0
multiple functions allowed	0	0	1	0	1	1	1	4
multiple functions allowed for certain technolog	1	1	0	0	0	0	0	2
please specify the multiple functions allowed for certain technologies								3
<i>answered question</i>								6
<i>skipped question</i>								1

please specify the multiple functions allowed for certain technologies

Chicago: Water stored in "volume control" BMPs (surface ponding, storage in the void spaces of an aggregate layer, etc.) can normally count toward meeting the 100-year detention volume. Volume of water stored in a green roof is not counted. Green roof benefits in the stormwater calcs by providing a lower c-factor (depending on depth) and counting toward a 15% impervious area reduction.

Tucson: Multiple function structures are the best and include erosion and sediment control, detention/retention, heat island reduction, increased aesthetics (ie watering trees in rain gardens comsumptively uses water, creates beauty, and reduces heat).

Seattle: Seems that there would never be enough space if we didnt allow multiple functions.

6. What type of credit(s) does your agency allow for porous pavement? (please select all that apply)
Which city do you represent?

Answer Options	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	Response Count
stand alone best management practices (BMPs)	1	0	1	0	0	1	0	3
impervious cover reduction	1	0	1	0	1	0	0	3
none	0	0	0	1	0	0	1	2
other (please specify)	1	0	0	0	0	0	1	2
<i>answered question</i>								6
<i>skipped question</i>								1

other (please specify)
Chicago: When infiltration rate of underlying soil is supported by infiltration testing, the infiltration rate will can be counted as additional release rate from the site thereby reducing the required detention volume.
Tucson: Too early in the process to know what credits will be provided.

7. Does your agency allow stormwater credit for porous pavement used on roads and parking lots?
Which city do you represent?

Answer Options	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	Response Count
yes	1	0	1	0	1	1	0	4
no	0	0	0	1	0	0	1	2
Please provide detail on the restrictions your agency might have regarding porous pavement.								3
<i>answered question</i>								6
<i>skipped question</i>								1

Please provide detail on the restrictions your agency might have regarding porous pavement.
Chicago: For permeable unit pavers placed in areas requiring underdrains (in areas of clay subsoils), the 10-year high water level must be at least 8 inches below the surface of the pavers.
Portland: No - just an impervious area reduction credit. Only approved on a case-by-case basis for public roadways, and there are only a half dozen or so existing installations.
Philadelphia: Porous pavement is considered disconnected impervious surface only if it manages rainfall that falls directly onto it (i.e., 1:1 drainage/treatment area). If the porous pavement received run-on and /or the storage base receives water from an adjacent area, the porous pavement system is considered a BMP and must be designed with an overflow structure connected to the sewer system. (Refer to the Philadelphia Stormwater Management Guidance Manual: <http://www.phillyriverinfo.org/Programs/SubprogramMain.aspx?id=StormwaterManual>)

8. Is your agency concerned about or has had issues regarding pollution hotspots under porous pavement or parking lots?
Which city do you represent?

Answer Options	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	Response Count
yes	0	0	1	0	1	0	0	2
no	1	0	0	1	0	1	1	4
Please explain in detail why you answered the question the way you did								5
<i>answered question</i>								6
<i>skipped question</i>								1

Please explain in detail why you answered the question the way you did
Chicago: We have not had any problems with this, but we are certainly concerned that permeable pavement or any infiltration BMP be used only when it is appropriate. Our requirements prohibit use of infiltration BMPs for a wide range of contaminated soils.
Portland: We look to prevent mobilization of underground pollutants in all cases.
Philadelphia: Per Philadelphia Stormwater Manual, areas of soil contamination should be avoided for any infiltration system. Geotechnical information is required to be submitted.
Tucson: We do not have enough porous pavement/parking lots and they are too young to know if they are pollution hotspots, though we are concerned about this.
Seattle: See stormwater manual (Seattle or new LID manual draft) for required vertical separation between bottom of pavement and groundwater, as well as

9. Has your agency conducted performance monitoring and evaluation, e.g., quantity and quality, of green infrastructure technologies?
Which city do you represent?

Answer Options	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	Response Count
yes	0	1	1	0	1	1	1	5
no	1	0	0	1	0	0	0	2
<i>answered question</i>								7
<i>skipped question</i>								0

10. Are your performance monitoring and evaluation findings for green infrastructure technologies available for public distribution?
Which city do you represent?

Answer Options	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	Response Count
yes	0	0	0	0	1	1	0	2
no	0	1	1	0	0	0	1	3
Please provide, if available, an electronic link for accessing the information.								5
<i>answered question</i>								5
<i>skipped question</i>								2

Please provide, if available, an electronic link for accessing the information.
New York: Not at this time. Please check back with us.
Portland: <http://www.portlandonline.com/bes/index.cfm?c=36055&>
Philadelphia: NOTE: PWD only recently started a comprehensive monitoring program. Once enough data area collected, reports will be available via www.phillyriverinfo.org
Tucson: Not yet.... (Marie Light - Hydrologist) In progress (Regional Flood Control District Case Studies assessment and WRRC (UA) studies) -- Mead Meir Sr Planner w Pima Assoc of Govts
Seattle: http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/GreenStormwaterInfrastructure/NaturalDrainageProjects/MeasuringSuccess/index.htm

11. If you have completed the questions from the Green Infrastructure Technology section, please provide your contact information.
Which city do you represent?

Answer Options	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	Response Count
Name	1	1	1	1	1	1	1	7
Title	1	1	1	1	1	1	1	7
Agency/Department	1	1	1	1	1	1	1	7
Address	1	1	1	1	1	0	1	6
Phone	1	1	1	1	1	1	1	7
Email	1	1	1	1	1	1	1	7
<i>answered question</i>								7
<i>skipped question</i>								0

Name	Title	Agency/Department	Address	Phone	Email
New York: Margot Walker	Director, GI Partnerships	NYC DEP	59-17 Junction	718-595-4367	margotw@dep.nyc.gov
Chicago: Andrew Billing, PE	Lead Stormwater Reviewer	Department of Buildings, City H:	121 N LaSalle	312-744-7774	abilling@mackieconsult.com
Portland: Tim Kurtz	Sustainable Stormwater, Bu	City of Portland, Oregon	1120 SW 5th A	503-823-5418	tim.kurtz@portlandoregon.gov
Philadelphia: Glen Abrams	Manager, Strategic Policy &	Philadelphia Water Department,	1101 Market S	215-685-6039	glen.abrams@phila.gov
Phoenix: Linda Palumbo	Environmental Program Coo	City of Phoenix, Water Services	2474 S. 22nd	/602-534-2916	linda.palumbo@phoenix.gov
Tucson: Marie Light	Principal Hydrologist	Pima County Department of Env	33 N. Stone, S	520-243-7457	marie.light@deq.pima.gov
Seattle: Tracy Tackett, PE	GSI Program Manager	Seattle Public Utilities		206.386.0052	tracy.tackett@seattle.gov

12. Which city do you represent?

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
Chicago	1	0	0	0	0	0	0	1
New York	0	1	0	0	0	0	0	1
Philadelphia	0	0	1	0	0	0	0	1
Phoenix	0	0	0	1	0	0	0	1
Portland	0	0	0	0	1	0	0	1
Seattle	0	0	0	0	0	1	0	1
Tucson	0	0	0	0	0	0	1	1
<i>answered question</i>								7
<i>skipped question</i>								0

II. GREEN INFRASTRUCTURE REGULATIONS

13. Does your agency require green infrastructure technology to be used for any of the following types of development? (please select all that apply)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
new development	1	1	0	0	1	1	1	5
redevelopment	1	1	0	0	1	1	1	5
city facilities	1	0	0	0	1	0	0	2
streets	0	0	0	0	1	0	0	1
special development districts	1	0	0	0	0	0	1	2
areas of special concern (water quality/flood/en	1	0	0	0	0	0	1	2
individual single-family houses	0	0	0	0	1	0	0	1
none of the above	0	0	1	0	0	0	0	1
other (please specify)	0	0	0	1	0	1	1	3
<i>answered question</i>								7
<i>skipped question</i>								0

other (please specify)

Phoenix: Following the COP Green Building Code is currently optional for development projects.
 Tucson: rural areas with Multiple Species Conservation Program.
 Seattle: any project, including streets, that triggers stormwater code.

14. If green infrastructure technology is required, do your stormwater regulations use the phrase "maximum extent feasible" or "maximum extent

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
yes	0	0	0	0	1	1	0	2
no	1	1	0	0	0	0	1	3
N/A	0	0	1	1	0	0	0	2
If so, please describe how this standard is reviewed/enforced.								3
<i>answered question</i>								7
<i>skipped question</i>								0

If so, please describe how this standard is reviewed/enforced.

Portland: Stormwater must be infiltrated onsite to the maximum extent feasible, before discharging any flows offsite. Project is reviewed by BES to determine site constraints, and permit is granted when they determine the standard has been met.
 Phoenix: Code is option. Green Code allows for different levels. Optional code sets minimum requirements for lowest level.
 Seattle: A work in progress. This link soon to have the latest formal guidance. <http://www.seattle.gov/dpd/Codes/StormwaterCode/DirectorsRules/default.asp> call if you want more info.

15. Which of the following regulatory incentives does your agency provide for green infrastructure? (please select all that apply)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
density bonus	0	0	0	0	1	0	1	2
landscaping credit	0	0	0	0	1	1	1	3
impervious cover credit	1	0	0	0	1	0	0	2
development process incentives, e.g., fee rebat	1	0	1	1	1	0	0	4
dedicated or expedited review	1	0	0	0	0	1	0	2
drainage fee reductions	0	0	0	0	1	1	0	2
subsidies/grants/low-interest loans	0	0	0	0	0	0	0	0
property tax/local improvement credits	1	0	0	0	0	0	0	1
none of the above	0	0	0	0	0	0	0	0
other (please specify)	0	1	0	1	0	0	1	3
<i>answered question</i>								7
<i>skipped question</i>								0

other (please specify)

New York: Storage volume reduction credit.
 Phoenix: Code is optional, incentives were given in 2011, but none are available this year.
 Tucson: Too early in the process for other bonuses.

16. For subdivision development, do you allow stormwater credit for decentralized stormwater controls e.g., rain gardens, rain barrels, that are installed on individual single-family lots?

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
yes	0	0	1	0	1	1	0	3
no	1	1	0	1	0	0	1	4
<i>answered question</i>								7
<i>skipped question</i>								0

17. How do you ensure that the decentralized stormwater controls will be maintained and function as originally designed over the project life cycle? (please

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
easement	0	0	1	1	1	0	0	3
maintenance agreement	0	0	1	0	1	0	0	2
restrictive covenant/deed restriction	0	1	1	0	1	0	0	3
apply a factor of safety to the sizing of controls	0	0	0	0	0	0	0	0
other (please describe)								4
<i>answered question</i>								4
<i>skipped question</i>								3

other (please describe)

Chicago: We require an Operation and Maintenance Plan that thoroughly describes necessary regular maintenance to be signed by the owner and kept on file with the City. We perform periodic inspections to verify construction and ongoing maintenance.
 Phoenix: Maintenance is the responsibility of the property owner, but the City reserves the right to clean-up drainage easements.
 Tucson: We are developing the controls with maintenance as one of the primary criteria. BMPs that become unsightly with time have a lower value.
 Seattle: Same as for all the traditional BMPs. Memorandum of Drainage Control i think.

18. How do you notify home buyers that green infrastructure technologies such as rain gardens are installed on their property? (please select all that apply)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
public mailing	0	0	0	0	1	0	0	1
deed (restriction)	0	1	1	0	1	0	0	3
seller's disclosure	0	0	0	0	0	1	0	1
don't notify homeowners	0	0	0	1	0	0	0	1
other (please specify)								2
<i>answered question</i>								5
<i>skipped question</i>								2

other (please describe)
Tucson: Unknown
Seattle: MDC shows up on sellers disclosure i believe. For RainWise its planned through mailings. As a whole we are still working on improving our processes around this topic.

19. Has your agency evaluated and/or changed other local codes and ordinances, e.g., transportation, landscaping, to remove barriers for using green

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
yes	0	1	1	0	1	1	1	5
currently evaluating	1	0	0	1	0	0	1	3
no	0	0	0	0	0	0	0	0
If so, please describe.	0	1	1	0	1	1	1	5
<i>answered question</i>								7
<i>skipped question</i>								0

If so, please describe.
New York: promulgated stormwater performance standard for new buildings and major alterations (Chapter 31 of Title 15 of the Rules of the City of New York)
Portland: Trees in right-of-way facilities are city responsibility (normally adjacent property owner).
Philadelphia: City of Philadelphia currently undergoing Zoning Code reform.
Tucson: Marie Light (Principal Hyrdologist) answered "currently evaluating". Irene Ogata (Urban Landscape Manager) answered "yes" and added "development standards for curb cuts changed and now allows for residential streets."
Seattle: Right-of-way improvmenet manual and some small land use clarifications. still have more to do. PNW now has a new guidance document required via the NPDES permit.

20. If you have completed the questions from the Green Infrastructure Regulations section, please provide your contact information.

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
Name	1	1	1	1	1	1	1	7
Title	1	1	1	1	1	1	1	7
Agency/Department	1	1	1	1	1	0	1	6
Address	1	0	1	1	1	0	1	5
Phone	1	1	0	1	1	0	1	5
Email	1	1	1	1	1	1	1	7
<i>answered question</i>								7
<i>skipped question</i>								0

Name	Title	Agency/Department	Address	Phone	Email
Julie Stein	Director, Wet Weather Plann	NYC DEP		718-595-4397	julies@dep.nyc.gov
Andrew Billing, PE	Lead Stormwater Reviewer	Department of Buildings, City Hall, Rm 906		312-744-7774	abilling@mackieconsult.com
Tim Kurtz	Sustainable Stormwater, Bui	City of Portland, Oregon		503-823-5418	tim.kurtz@portlandoregon.gov
Victoria Lenoci	Civil Engineer	Philadelphia Water Department - Stormwater I		NA	victoria.lenoci@phila.gov
James C. Taschner	Civil Engineer III	City of Phonix Plannning and Development D		602-495-0464	jim.taschner@phoenix.gov
Tucson: Marie Light	Principal Hydrologist	Pima County Department of Env	33 N. Stone, S 520-243-7457		marie.light@deq.pima.gov
Seattle: Tracy Tackett, PE	GSI Program Manager	Seattle Public Utilities		206.386.0052	tracy.tackett@seattle.gov

21. Which city do you represent?

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
Chicago	1	0	0	0	0	0	0	1
New York	0	1	0	0	0	0	0	1
Philadelphia	0	0	1	0	0	0	0	1
Phoenix	0	0	0	1	0	0	0	1
Portland	0	0	0	0	1	0	0	1
Seattle	0	0	0	0	0	1	0	1
Tucson	0	0	0	0	0	0	1	1
<i>answered question</i>								7
<i>skipped question</i>								0

III. MAINTENANCE AND OPERATIONS FOR GREEN INFRASTRUCTURE CONTROLS

22. Do you perform inspections during the installation of green infrastructure to ensure regulatory compliance?

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
yes	0	0	1	1	1	1	1	5
no	1	0	0	0	0	0	0	1
<i>answered question</i>								6
<i>skipped question</i>								1

23. Do you perform inspections after the installation of green infrastructure to ensure regulatory compliance?

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
yes	1	0	1	1	1	1	0	5
no	0	0	0	0	0	0	1	1
<i>answered question</i>								6
<i>skipped question</i>								1

24. Are regular inspections required for green infrastructure technologies located on single family lots?

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
yes	0	0	1	0	0	0	0	1
no	1	0	0	1	1	1	1	5
<i>answered question</i>								6
<i>skipped question</i>								1

25. How often are inspections of green infrastructure technologies located on single family lots conducted? (please select one answer)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
annually	0	0	0	0	0	0	0	0
bi-annually	0	0	0	0	0	0	0	0
less than once a year	0	0	1	0	0	0	0	1
none	0	0	0	0	0	0	0	0
other (Please specify)	0	0	0	0	0	0	0	0
<i>answered question</i>								1
<i>skipped question</i>								6

26. Who is responsible for the maintenance of green infrastructure technologies such as rain gardens located on single family lots? (please select all that apply)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
city agency	0	0	0	0	0	0	0	0
land owner	0	0	1	1	1	1	1	5
homeowners association (HOA)	0	0	0	0	0	1	1	2
other	1	0	0	0	0	0	0	1
If other is selected, please specify the agency r	0	0	0	0	0	0	0	0
<i>answered question</i>								6
<i>skipped question</i>								1

27. Please describe in detail the type of maintenance required or performed on porous pavement.

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
	0	0	1	0	0	1	1	3
<i>answered question</i>								3
<i>skipped question</i>								4

Response
Philadelphia: Vacuum porous asphalt or concrete surface bianually.
Tucson: still exploring (IreneOgata - Urban Landscape Manager)
Seattle: pressure washing and or vacuum sweeping.

28. How often do you inspect the following green infrastructure technologies? (please select one for each green infrastructure)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
rain gardens/bioretention								
annually	0	0	0	0	0	0	0	6
bi-annually	0	0	1	0	1	1	1	
less than once a year	1	0	0	0	0	0	0	
N/A	0	0	0	1	0	0	0	
	1	0	1	1	1	1	1	
green roofs								
annually						0	0	6
bi-annually	0	0	1	0	1	0	0	
less than once a year	0	0	0	0	0	0	0	
N/A	0	0	0	1	0	1	1	
	1	0	1	1	1	1	1	
biofiltration								
annually	0	0	0	0	0	0	0	6
bi-annually	0	0	1	0	1	1	0	
less than once a year	1	0	0	0	0	0	0	
N/A	0	0	0	1	0	0	1	
	1	0	1	1	1	1	1	
cisterns/rain barrels								
annually	0	0	0	0	0	1	0	6
bi-annually	0	0	0	0	0	0	1	
less than once a year	1	0	0	0	0	0	0	
N/A	0	0	1	1	1	0	0	
	1	0	1	1	1	1	1	
porous pavement								
annually	0	0	1	0	0	0	0	6
bi-annually	0	0	0	0	1	1	1	
less than once a year	1	0	0	0	0	0	0	
N/A	0	0	0	1	0	0	0	
	1	0	1	1	1	1	1	
vegetated filter strips								
annually	0	0	0	0	0	1	0	6
bi-annually	0	0	0	0	1	0	0	
less than once a year	1	0	0	0	0	0	0	
N/A	0	0	1	1	0	0	1	
	1	0	1	1	1	1	1	
other (please provide additional comments)								5
<i>answered question</i>								6
<i>skipped question</i>								1

other (please provide additional comments)
Portland: Frequencies for public facilities only. Inspections on private facilities are irregular.
Philadelphia: This inspection schedule is only for publicly maintained green infrastructure, not private green infrastructure.
Phoenix: Retention basins are inspected at the end of our one year warranty, no other follow-up inspections are made after the one-year period.
Tucson: Green roofs and vegetated filter strips are not typically used (Marie Light - Principle Hydrologist). Residential roadway stormwater harvesting projects usually checked as needed; usually during and after rain event to evaluate performance (anecdotal - no quantitative survey) Iren Ogata Urban Landscape Manager.
Seattle: SPU incharge of maintenance of facilities in Right-of-ways only. Or installed for RainWise; rainwise is planned annual for some random % of installations.

29. How often do you maintain the following green technologies? (please select one for each green infrastructure technology)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
rain gardens/bioretenion								
monthly	0	0	1	0	0	1	0	6
quarterly	0	0	0	0	1	0	0	
annually	1	0	0	0	0	0	0	
less than once a year	0	0	0	0	0	0	0	
N/A	0	0	0	1	0	0	1	
	1	0	1	1	1	1	1	
green roofs								
monthly	0	0	0	0	0	0	0	6
quarterly	0	0	1	0	0	0	0	
annually	1	0	0	0	1	0	0	
less than once a year	0	0	0	0	0	0	0	
N/A	0	0	0	1	0	1	1	
	1	0	1	1	1	1	1	
biofiltration								
monthly	0	0	0	0	0	1	0	6
quarterly	0	0	1	0	1	0	0	
annually	1	0	0	0	0	0	0	
less than once a year	0	0	0	0	0	0	0	
N/A	0	0	0	1	0	0	1	
	1	0	1	1	1	1	1	
cisterns/rain barrels								
monthly	0	0	0	0	0	0	0	6
quarterly	0	0	0	0	0	0	0	
annually	1	0	0	0	0	0	0	
less than once a year	0	0	0	0	0	0	0	
N/A	0	0	1	1	1	1	1	
	1	0	1	1	1	1	1	
porous pavement								
monthly	0	0	0	0	0	0	0	6
quarterly	0	0	1	0	0	0	0	
annually	1	0	0	0	1	1	0	
less than once a year	0	0	0	0	0	0	0	
N/A	0	0	0	1	0	0	1	
	1	0	1	1	1	1	1	
vegetated filter strips								
monthly	0	0	0	0	0	0	0	6
quarterly	0	0	0	0	0	0	0	
annually	1	0	0	0	1	0	0	
less than once a year	0	0	0	0	0	0	0	
N/A	0	0	1	1	0	1	1	
	1	0	1	1	1	1	1	
other								6
								6
						<i>answered question</i>		6
						<i>skipped question</i>		1

other (please provide additional comments)

Chicago: The City requires that the owner maintains BMPs on private developments.

Portland: Frequencies for public facilities only. Inspections on private facilities are irregular.

Philadelphia: This inspection schedule is only for publicly maintained green infrastructure, not private green infrastructure.

Phoenix: The only material being tested in the City is porous pavement. The requirement for porous pavement is every six months.

Tucson: green roofs and vegetated filter strips are rare. (Marie Light - Principle Hydrologist) Many of the residential stormwater projects are relatively new (less than 2-years old) soe routine maintenance has not been addressed (Irene Ogata Urban Landscape Manager).

Seattle: right-of-way installations. Theoretically every two weeks, but clarity and staffing around achieving our level or service has been a work in progress.

30. What type of maintenance do you perform for each of the following green technologies? (please select more than one response per each)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
rain gardens/bioretenion								
litter removal	1	0	1	0	1	1	0	25
landscape maintenance (vegetation removal)	1	0	1	0	1	1	0	
removal of clogging materials	0	0	1	0	1	1	0	
soil or mulch replacement	1	0	1	0	1	1	0	
media replacement	0	0	0	0	0	1	0	
erosion control	1	0	1	0	1	1	0	
irrigation	1	0	1	0	0	1	0	
N/A	0	0	0	1	0	0	1	
	5	0	6	1	5	7	1	
green roofs								
litter removal	1	0	0	0	0	0	0	11
landscape maintenance (vegetation removal)	1	0	1	0	1	0	0	
removal of clogging materials	0	0	1	0	0	0	0	
soil or mulch replacement	0	0	0	0	0	0	0	
media replacement	0	0	0	0	0	0	0	
erosion control	0	0	0	0	0	0	0	
irrigation	1	0	1	0	1	0	0	
N/A	0	0	0	1	0	1	1	
	3	0	3	1	2	1	1	
biofiltration								
litter removal	1	0	1	0	1	1	0	24
landscape maintenance (vegetation removal)	1	0	1	0	1	1	0	
removal of clogging materials	0	0	1	0	1	1	0	
soil or mulch replacement	1	0	1	0	1	1	0	
media replacement	0	0	0	0	0	1	0	
erosion control	1	0	1	0	1	1	0	
irrigation	1	0	0	0	0	1	0	
N/A	0	0	0	1	0	0	1	
	5	0	5	1	5	7	1	
cisterns/rain barrels								
litter removal	0	0	0	0	0	0	0	6
landscape maintenance (vegetation removal)	0	0	0	0	0	0	0	
removal of clogging materials	1	0	0	0	0	0	0	
soil or mulch replacement	0	0	0	0	0	0	0	
media replacement	0	0	0	0	0	0	0	
erosion control	0	0	0	0	0	0	0	
irrigation	0	0	0	0	0	0	0	
N/A	0	0	1	1	1	1	1	
	1	0	1	1	1	1	1	
porous pavement								
litter removal	1	0	1	0	0	1	0	12
landscape maintenance (vegetation removal)	1	0	0	0	0	1	0	
removal of clogging materials	1	0	1	0	1	1	0	
soil or mulch replacement	0	0	0	0	0	0	0	
media replacement	0	0	0	0	0	0	0	
erosion control	0	0	0	0	0	1	0	
irrigation	0	0	0	0	0	0	0	
N/A	0	0	0	1	0	0	1	
	3	0	2	1	1	4	1	
vegetated filter strips								
litter removal	1	0	0	0	1	1	0	13
landscape maintenance (vegetation removal)	1	0	0	0	1	1	0	
removal of clogging materials	0	0	0	0	0	1	0	
soil or mulch replacement	0	0	0	0	0	0	0	
media replacement	0	0	0	0	0	1	0	
erosion control	0	0	0	0	1	1	0	
irrigation	0	0	0	0	0	0	0	
N/A	0	0	1	1	0	0	1	
	2	0	1	1	3	5	1	
Other								3
						<i>answered question</i>		6
						<i>skipped question</i>		1

Other (please provide additional comments)

Chicago: The City requires that the owner maintains BMPs on private developments.

Portland: For our purposes, Biofiltration = lined facilities (non-infiltration)

Seattle: see O&M manuals. ROW is

http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/GreenStormwaterInfrastructure/NaturalDrainageProjects/OperationsMaintenance/index.htm

31. How many green infrastructure facilities do you have in place that are inspected? (please include a numeric answer for each green infrastructure technology)									
Which city do you represent?									
Answer Options	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	Response Total	Response Count
rain gardens/bioretenion	0	0	1	1	0	1	0	81	3
green roofs	0	0	1	1	0	1	1	19	4
biofiltration	0	0	1	1	0	1	0	51	3
cisterns/rain barrels	0	0	1	1	0	1	0	0	3
porous pavement	0	0	1	1	0	1	0	102	3
vegetated filter strip	0	0	1	1	0	1	0	24	3
Other	0	0	0	0	0	0	0	0	0
<i>answered question</i>									4
<i>skipped question</i>									3

32. For each of the green technologies listed below, how many do you publicly maintain? (please include a numeric answer for each green infrastructure technology)									
Which city do you represent?									
Answer Options	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	Response Total	Response Count
rain gardens/bioretenion	0	0	1	1	1	1	0	1136	5
green roofs	0	0	1	1	1	1	1	8	5
biofiltration	0	0	1	1	0	1	0	14	4
cisterns/rain barrels	0	0	1	1	1	1	0	0	5
porous pavement	0	0	1	1	1	1	0	18	5
vegetated filter strips	0	0	1	1	0	1	0	0	4
other	0	0	1	0	0	0	0	12	1
<i>answered question</i>									5
<i>skipped question</i>									2

33. For each of the green technologies listed below, how many are maintained by a private entity? (please include a numeric answer for each green infrastructure technology)									
Which city do you represent?									
Answer Options	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	Response Total	Response Count
rain gardens/bioretenion	0	0	1	1	1	1	0	1723	4
green roofs	0	0	1	1	1	0	1	311	4
biofiltration	0	0	1	1	1	0	0	592	3
cisterns/rain barrels	0	0	1	1	1	0	0	30	3
porous pavement	0	0	1	1	1	1	0	237	4
vegetated filter strips	0	0	1	1	1	0	1	44	4
other	0	0	0	1	0	0	0	0	1
<i>answered question</i>									5
<i>skipped question</i>									2

34. What is the average annual unit cost to maintain each of the following green technologies? (please include an answer for each green infrastructure technology)									
Which city do you represent?									
Answer Options	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	Response Count	
rain gardens/bioretenion	0	0	0	0	1	1	1	3	
green roofs	0	0	0	0	1	0	1	2	
biofiltration	0	0	0	0	1	1	1	3	
cisterns/rain barrels	0	0	0	0	0	0	1	1	
porous pavement	0	0	0	0	0	1	1	2	
vegetated filter strips	0	0	0	0	0	0	1	1	
other	0	0	1	1	0	1	1	4	
<i>answered question</i>									5
<i>skipped question</i>									2

35. If you have completed the questions from the Maintenance & Operations section, please provide us with the following information.									
Which city do you represent?									
Answer Options	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	Response Count	
Name	1	0	1	1	1	1	1	6	
Title	1	0	1	1	1	0	1	5	
Agency/department	1	0	1	1	1	1	1	6	
Address	1	0	1	1	1	1	1	6	
Phone	1	0	1	1	1	1	1	6	
Email	1	0	1	1	1	1	1	6	
<i>answered question</i>									6
<i>skipped question</i>									1

Name	Title	Agency/department	Address	Phone	Email
Andrew Billing, PE	Lead Stormwater Reviewer	Department of Buildings, City of Chicago	121 N LaSalle	312-744-7774	abilling@mackieconsult.com
Tim Kurtz	Sustainable Stormwater, Bureau of Environmental Services	City of Portland, Oregon	1120 SW 5th Ave	503-823-5418	tim.kurtz@portlandoregon.gov
Chris Bergerson	Green Infrastructure Maintainer	Philadelphia Water Department	1101 Market St	215-685-6234	Chris.Bergerson@phila.gov
James C. Taschner, P.E.	Civil Engineer III	City of Phoenix Planning and Development	200 West Washington	602-495-0464	jim.taschner@phoenix.gov
Marie Light	Principal Hydrologist	Pima County Department of Environmental Services	33 N. Stone Ave	520-243-7457	marie.light@deq.pima.gov
Drena Donofrio, P.E. for Tracy Tackett		Seattle Public Utilities	700 5th Avenue	206-571-1566	Drena.Donofrio@seattle.gov

36. Which city do you represent?									
Which city do you represent?									
Answer Options	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	Response Count	
Chicago	1	0	0	0	0	0	0	1	
New York	0	0	0	0	0	0	0	0	
Philadelphia	0	0	1	0	0	0	0	1	
Phoenix	0	0	0	1	0	0	0	1	
Portland	0	0	0	0	1	0	0	1	
Seattle	0	0	0	0	0	1	0	1	
Tucson	0	0	0	0	0	0	1	1	
<i>answered question</i>									6
<i>skipped question</i>									1

IV. GREEN INFRASTRUCTURE EDUCATION AND OUTREACH

37. Do you have green infrastructure education and outreach programs?

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
yes	1	1	1	1	1	1	1	7
no	0	0	0	0	0	0	0	0
<i>answered question</i>								7
<i>skipped question</i>								0

38. Which of the following green infrastructure technologies are the focus of your education and outreach?(choose all that apply)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
rain gardens/bioretenion	1	1	1	1	1	1	1	7
biofiltration	1	1	0	0	1	0	1	4
green roof	1	1	0	0	1	1	0	4
porous pavement	1	1	1	0	0	1	1	5
vegetated filter strips	1	1	1	0	0	0	0	3
cisterns/rain barrels	1	1	1	1	1	1	1	7
other (please specify)	0	1	0	0	0	0	1	2
<i>answered question</i>								7
<i>skipped question</i>								0

other (please specify)

Tucson: water course preservaton, pollution prevention
New York: blue roofs and other detention technologies.

39. Who does your green infrastructure outreach and education program target? (choose all that apply)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
developer	1	1	1	0	0	0	1	4
individual homeowners	1	0	1	1	1	1	1	6
engineer	1	1	0	0	0	0	0	2
landscape architect	0	1	0	0	0	1	1	3
contractor	0	0	0	0	0	0	1	1
other (please specify)	0	1	1	0	0	0	1	3
<i>answered question</i>								7
<i>skipped question</i>								0

other (please specify)

New York: community stakeholders, enviro advocates, waterbody specific community groups
Philadelphia: business and industry
Tucson: General public

40. At what level is your green infrastructure education and outreach program organized and promoted? (please select all that apply)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
neighborhood	0	1	1	1	1	0	0	4
watershed	0	1	1	0	1	1	0	4
citywide	1	1	1	1	1	1	0	6
other (please specify)	0	0	0	0	0	0	1	1
<i>answered question</i>								7
<i>skipped question</i>								0

other (please specify)

Tucson: Region-wide (Pima County)

41. Which of the following do you use to promote the use of green infrastructure? (please select all that apply)

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
trade shows, seminars, webinars	1	0	1	1	1	0	1	5
demonstration projects	0	1	1	0	1	1	0	4
youth education	0	0	1	1	1	1	1	5
rebates	0	0	1	0	1	1	0	3
website	1	1	1	1	1	1	1	7
social media such as twitter, facebook, etc.	0	1	1	0	1	0	1	4
marketing collateral such as brochures and oth	1	0	1	1	1	1	0	5
other (please specify)	0	1	0	0	0	0	1	2
<i>answered question</i>								7
<i>skipped question</i>								0

other (please specify)

New York: presentations, print material, collaborations/partnerships
Tucson: bus posters, Billboards TV ads, radio ads, Movie theatre ads, Magazine ads; all a part of Clean Water Starts With Me! campaign. The City may also have separate, more detailed outreach for the Rainwater Harvesting Ordinance.

42. Do you use pre and post survey research to measure awareness and usage of your green infrastructure education and outreach program?

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
yes	0	0	0	1	1	0	0	2
no	0	1	1	0	0	0	1	3
don't know	1	0	0	0	0	0	0	1
<i>answered question</i>								6
<i>skipped question</i>								1

43. If you completed the questions from Green Infrastructure Education and Outreach section, please provide us with the following information.

Answer Options	Which city do you represent?							Response Count
	Chicago	New York	Philadelphia	Phoenix	Portland	Seattle	Tucson	
Name	1	1	1	1	0	1	1	6
Title	1	0	1	1	0	1	1	5
Agency/department	1	1	1	1	0	1	1	6
Address	1	0	1	1	0	0	1	4
Phone	1	0	1	1	0	1	1	5
Email	1	0	1	1	0	1	1	5
<i>answered question</i>								6
<i>skipped question</i>								1

Name	Title	Agency/dep artment	Address	Phone	Email
Margot Walker		NYC DEP			
Andrew Billing, PE		Lead Stormwa	Department of Buildings, City H: 121 N LaSalle St, Chicago, IL 312-744-7774		abilling@mackieconsult.com
Paul Fugazzotto		Communicatio	Philadelphia Water Department 1101 Market Street, Philadelp	267-625--2800	paul.fugazzotto@phila.gov
Dana Walker		Water Resour	City of Phoenix - Water Services 200 W. Washington St., 9th Fl	602-261-8366	dana.walker@phoenix.gov
Mead Meir		Senior Watershed Planner	Pima Association of Governmer 177 N Church	520-792-1093	mmier@pagnet.org

